KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agri. Engg) 2020 Admission
II Semester Final Examination- October 2021

Fpme.1202 **Theory of Machines (2+0)**

Marks: 50
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. An assemblage of links in which motion of one link produces a definite motion in other is called _____.
2. Displacement of a body is _____ than the distance the body moves if there is change in direction of motion.
3. _____ type of gears are used to transmit power between two parallel shafts and are not subjected to any axial forces.
4. A _____ is a curve traced by a point on the rim of a circular wheel as the wheel rolls along a straight path without slipping.
5. A governor is said to be _____ when for each speed in the working range there is only one radius of rotation of the governor balls.
6. What is the pitch circle diameter of a rack gear in a rack and pinion arrangement?
7. In a crossed belt drive, the velocity ratio of the two pulleys is _____proportional to their diameters.
8. The ratio of circular pitch to the module of a gear is _____.
9. To control the position of a flat belt on the pulley surface, the pulley surface is provided with _____.

State true or false:

10. A four bar linkage with two sliding pairs is called a slider crank mechanism.

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. List various factors required for interchangability between gears.
2. In a four bar linkage ABCD, the links AB and CD are of same length. The link AB rotates at 36 rad/s about point A. Calculate the rpm of CD about point D.
3. Differentiate between lower pair and higher pair.
4. List various factors which help you to decide whether V-belt drive is to be used or a flat belt drive is to be selected for a given application
5. List the advantages of cone clutch over single disc clutch.
6. What is the function of a governor? How does it differ from that of a flywheel?
7. What is chordal action in roller chain drives? Is it required or not- ? Justify.

III **Answer ANY FIVE of the following** **(5x4=20)**

1. Derive the following relation $\frac{T_1}{T_2} = (e)^{\mu\theta}$ for a flat belt drive with usual notations.
2. A 9 tooth sprocket operating at 200 rpm drives a 23 tooth sprocket through a chain whose pitch is 41.4 mm and the ultimate strength is 9.34kN. Calculate the average linear speed of the chain.
3. A single plate friction clutch with both sides of a plate being effective is used to transmit power at an engine speed of 200 rpm. It has outer and inner radii 10 cm and 8 cm respectively. Find Maximum axial thrust and torque transmitted if coefficient of friction is assumed as 0.25.

4. A flywheel absorbs 24kJ of energy on increasing its speed from 210 rpm to 214 rpm. Predict the kinetic energy at 250 rpm.
5. In a crank and slotted lever quick return motion mechanism, the distance between the fixed centres is 240 mm and the length of the driving crank is 120 mm. Length of the slotted bar is 450 mm. Find: a) Inclination of the slotted bar with the vertical in the extreme position b) Time ratio of cutting stroke to the return stroke and c) Length of the stroke.
6. The maximum power transmitted by a belt is 60kW. The belt is 250mm wide and 10 mm thick and weights 9.81 kN/m^3. If the ratio of tensions in the tight and slack sides is 2, determine the maximum stress induced in the belt.
7. A V-belt runs over a pulley of 800 mm in diameter at a speed of 180 rpm. The angle of lap is 165° and the maximum tension in the belt is 2kN. Determine the power transmitted if the coefficient of friction between the belt and the pulley is 0.3.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. A Porter governor has all four arms 300 mm long. The upper arms are pivoted on the axis of rotation and lower arms are attached to the sleeve at a distance of 3.5 mm from the axis. The mass of each ball is 7kg and the mass of sleeve is 54 kg. If the extreme radii of rotation of the balls are 200 mm and 250 mm, find the range of speed of the governor.
2. A chain drive is used for speed reduction from 240 to 110 rpm. The number of teeth on the driving sprocket is 22. The centre distance between two sprockets is 540 mm and the pitch circle diameter of the driven sprocket is 480 mm. Determine the number of teeth on the driven sprocket, pitch and the length of the chain.

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